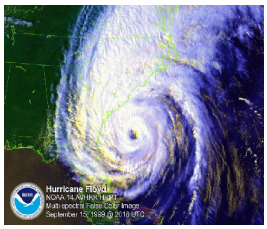
The U.S. Weather Research Program's Hurricanes at Landfall



As Hurricane Floyd approached the southeastern U.S., uncertainty regarding its landfall led to the evacuation of thousands of residents from the Florida coastline before the storm eventually made landfall in NC.

Photo by Dave Saville/FEMA News Photo

Hurricane Floyd dumped over 16" of rain on parts of southeastern NC. Here, the rain-swollen Tar River flows through a neighborhood in Greenville, NC. In NC, inland flooding from Hurricane Floyd caused over $250 million in housing damage and destroyed approximately 3,680 homes.

NOAA Request

NOAA is requesting an additional $1.0 million in the weather research line of the Oceanic and Atmospheric Research (OAR) budget activity for the second year of the U.S. Weather Research Program's (USWRP) Hurricanes at Landfall research program. This research will work towards extending the forecasts of the location and amount of precipitation to at least two days in advance of a hurricane's arrival. This advanced warning will give residents more time to complete mitigating actions, such as sandbagging, boarding up, and evacuating, in an attempt to minimize the damage from potential floods and to avoid a repeat of Hurricane Floyd's tremendous flood damage. Greater accuracy of forecasts will also generate savings by narrowing the length of coastline along which mitigation efforts need to be undertaken.

Background

As millions of Americans move to coastal areas, the U.S. population becomes increasingly more vulnerable to the effects of a major hurricane landfall along the East or Gulf Coasts of the United States. According to the Hurricane Research Division of NOAA's Atlantic Oceanographic Meteorological Laboratory, the extreme hurricane activity since 1995 could mark the start of a more active hurricane period that may last 25-40 years. Additionally, inland flooding following hurricane landfall is becoming increasingly more devastating as Americans continue the trend of building new homes and businesses in low-lying flood plains. For example, in 1999, rain from Hurricane Floyd caused 14 states to declare major disasters. North Carolina was particularly hard hit with over 16" of rain falling in parts of the state. The News & Observer reported that inland flooding in North Carolina caused over $250 million in housing damages. Additionally, damages from Floyd's flooding will continue to ripple through the economy due to closed businesses and sky-rocketing unemployment rates. In all, 48 people died and total damages could exceed $6 billion. The Hurricanes at Landfall program will work towards extending the forecasts of the location and amount of precipitation to at least two days prior to a hurricane's arrival. These advanced warnings will enable residents to complete mitigating actions, such as sandbagging, in an attempt to reduce potential flood damage and to prevent a repeat of Hurricane Floyd's flooding. Moreover, several major U.S. localities, like Tampa Bay, New Orleans and Manhattan, have escape routes that are narrow and prone to congestion or that could potentially be closed hours before hurricane landfall due to high winds or storm surge. Early, accurate landfall predictions are required to prevent potentially catastrophic losses of life resulting from evacuations that cannot be completed in time.

Many U.S. cities face the prospect of severe congestion on evacuation routes if a mandatory evacuation is required. Adequate warning time is needed to save lives by allowing mandatory evacuations to be completed before the hurricane makes landfall.

Proposed Actions

This initiative, with a science plan agreed upon by representatives from NOAA, NSF, NASA, and the Navy, will conduct the research required to significantly improve the forecasts of hurricane landfalls and potential inland flooding so that coastal residents can be better protected from future hurricanes. Through this joint science plan, the initiative leverages resources between the four agencies. Key to this initiative is a thorough understanding of the internal processes within hurricanes and their interactions with the immediate environment that control their intensity, propagation, speed, and direction. In order to do this, NOAA will research and develop experimental numerical model algorithms, provide field observational support for and analysis of special or enhanced observations, and conduct technology and information transfers to operations and services in NOAA's National Weather Service.

As part of the program, OAR will increase flight hours of NOAA's Gulfstream IV as well as increase the amount and frequency of data collected, such as from its dropsondes, to provide the detail necessary for these studies. These flights will be coordinated with the NOAA P-3 and the NASA aircraft. Also, OAR, in coordination with the Navy and NSF funded university research, will improve parameterization of internal hurricane processes such as precipitation formation, water vapor fluxes and air/sea energy transfer. Additionally, NOAA's National Environmental Satellite, Data and Information Service (NESDIS) will develop improved algorithms for satellite-based wind, moisture, and precipitation observations in hurricanes to be used by researchers and by NOAA's National Weather Service (NWS) for forecast model initialization. Finally, the NWS, in coordination with the university community and NOAA laboratories, will develop new data assimilation capabilities to move the data into new models for comparison with operational forecasts in order to evaluate how the new models performed.

NOAA aircraft, called hurricane hunters, fly into developing tropical storms and hurricanes to collect the data required to develop and verify computer storm models. These models can be used to more accurately predict hurricane landfall and intensity.

Benefits

Reducing the length of coastline under hurricane warnings saves at least $1 million per coastal mile in costs of evacuations and other preparedness actions. At this savings rate, the costs of the initiative can be recovered rapidly as potential hurricane landfall, warning, and evacuation zones are narrowed as a result of new storm models stemming from this research. With about 75% of the insured losses in this country directly caused by weather and 95% of the Presidentially declared disasters over the last decade weather-related, even small forecast improvements can lead to significant benefits. This initiative will help NOAA achieve one of its mission goals, to Advance Short-Term Warning and Forecast Services, and will take great strides towards protecting the lives and properties of rapidly expanding U.S. coastal communities.

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